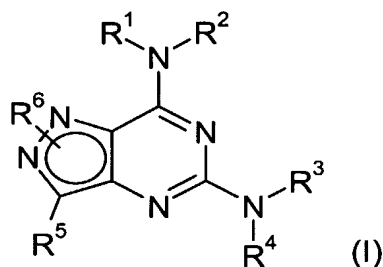


Claims

1. A compound of formula (I)



wherein

R^1 is a cyclic group selected from R^A , R^B , R^C and R^D , each of which is optionally substituted with one or more R^7 groups;

R^2 is hydrogen or C_1 - C_2 alkyl;

R^3 and R^4 are each independently C_1 - C_8 alkyl, C_2 - C_8 alkenyl, C_2 - C_8 alkynyl or C_3 - C_{10} cycloalkyl, each of which is optionally substituted with one or more R^8 groups, or R^E , which is optionally substituted with one or more R^9 groups, or hydrogen;

or $-NR^3R^4$ forms R^F , which is optionally substituted with one or more R^{10} groups;

R^5 is $-Y-NR^{15}R^{16}$;

R^6 , which may be attached at N^1 or N^2 , is C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_2 - C_6 alkenyl or C_2 - C_6 alkynyl, each of which is optionally substituted by C_1 - C_6 alkoxy, $(C_3$ - C_6 cycloalkyl)methoxy, C_1 - C_6 haloalkoxy or a cyclic group selected from R^J , R^K , R^L and R^M , or R^6 is R^N , C_3 - C_7 cycloalkyl or C_3 - C_7 halocycloalkyl, each of which is optionally substituted by C_1 - C_6 alkoxy or C_1 - C_6 haloalkoxy, or R^6 is hydrogen;

R^7 is halo, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_3 - C_{10} cycloalkyl, C_3 - C_{10} halocycloalkyl, phenyl, OR^{12} , $OC(O)R^{12}$, NO_2 , $NR^{12}R^{13}$, $NR^{12}C(O)R^{13}$, $NR^{12}CO_2R^{14}$, $C(O)R^{12}$, CO_2R^{12} , $CONR^{12}R^{13}$ or CN ;

R^8 is halo, phenyl, C_1 - C_6 alkoxyphenyl, OR^{12} , $OC(O)R^{12}$, NO_2 , $NR^{12}R^{13}$, $NR^{12}C(O)R^{13}$, $NR^{12}CO_2R^{14}$, $C(O)R^{12}$, CO_2R^{12} , $CONR^{12}R^{13}$, CN , C_3 - C_6 cycloalkyl, R^G or R^H , the last two of which are optionally substituted with one or more R^9 groups;

R^9 is C_1 - C_6 alkyl, C_1 - C_6 haloalkyl or CO_2R^{12} ;

R^{10} is halo, C_3 - C_{10} cycloalkyl, C_3 - C_{10} halocycloalkyl, phenyl, OR^{12} , $OC(O)R^{12}$, NO_2 , $NR^{12}R^{13}$, $NR^{12}C(O)R^{13}$, $NR^{12}CO_2R^{14}$, $C(O)R^{12}$, CO_2R^{13} , $CONR^{12}R^{13}$, CN, oxo, C_1 - C_6 alkyl or C_1 - C_6 haloalkyl, the last two of which are optionally substituted by R^{11} ;

R^{11} is phenyl, $NR^{12}R^{13}$ or $NR^{12}CO_2R^{14}$;

R^{12} and R^{13} are each independently hydrogen, C_1 - C_6 alkyl or C_1 - C_6 haloalkyl;

R^{14} is C_1 - C_6 alkyl or C_1 - C_6 haloalkyl;

R^{15} is selected from R^{17} , $R^{17}C(O)$ and $R^{18}SO_2$, and

R^{16} is selected from hydrogen, C_1 - C_6 alkyl optionally substituted with one or more R^{19} groups, C_1 - C_6 haloalkyl and C_3 - C_{10} cycloalkyl optionally substituted with one or more R^{20} groups,

or $-NR^{15}R^{16}$ constitutes a 3- to 8-membered saturated ring which may optionally include one or more further heteroatoms selected from nitrogen, oxygen and sulphur, and which may optionally be substituted with one or more groups selected from R^{21} , R^{22} and $(C_1$ - C_6 alkoxy) C_1 - C_6 alkyl;

R^{17} is hydrogen or R^{18} ;

R^{18} is selected from C_1 - C_6 alkyl optionally substituted with one or more R^{19} groups, C_1 - C_6 haloalkyl and C_3 - C_{10} cycloalkyl optionally substituted with one or more R^{20} groups;

R^{19} is selected from R^{21} , $-NR^{23}R^{24}$, $-CO_2R^{25}$, $-CONR^{26}R^{27}$, R^{28} and phenyl optionally substituted by R^{29} ;

R^{20} is selected from R^{21} , R^{22} and oxo;

R^{21} is oxo, hydroxy, C_1 - C_6 alkoxy, C_1 - C_6 (haloalkyl)oxy or C_3 - C_7 cycloalkyloxy;

R^{22} is C_1 - C_6 alkyl or C_1 - C_6 haloalkyl;

R^{23} and R^{24} are each independently selected from hydrogen and C_1 - C_6 alkyl;

or $-NR^{23}R^{24}$ constitutes an azetidine, pyrrolidine, piperidine or morpholine ring;

R^{25} is hydrogen or C_1 - C_6 alkyl;

R^{26} and R^{27} are each independently selected from hydrogen and C_1 - C_6 alkyl;

or $-NR^{26}R^{27}$ constitutes an azetidine, pyrrolidine, piperidine or morpholine ring;

R²⁸ is a saturated, unsaturated or aromatic heterocycle with up to 10 ring atoms, at least one of which is selected from nitrogen, oxygen and sulphur;

R²⁹ is selected from halo, R²¹ and R²²,

R^A and R^J are each independently a C₃-C₁₀ cycloalkyl or C₃-C₁₀ cycloalkenyl group, each of which may be either monocyclic or, when there are an appropriate number of ring atoms, polycyclic and which may be fused to either

- (a) a monocyclic aromatic ring selected from a benzene ring and a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur, or
- (b) a 5-, 6- or 7-membered heteroalicyclic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;

R^B and R^K are each independently a phenyl or naphthyl group, each of which may be fused to

- (a) a C₅-C₇ cycloalkyl or C₅-C₇ cycloalkenyl ring,
- (b) a 5-, 6- or 7-membered heteroalicyclic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur, or
- (c) a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;

R^C, R^L and R^N are each independently a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated or partly unsaturated ring system containing between 3 and 10 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur, which ring may be fused to a C₅-C₇ cycloalkyl or C₅-C₇ cycloalkenyl group or a monocyclic aromatic ring selected from a benzene ring and a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;

R^D and R^M are each independently a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur, which ring may further be fused to

- (a) a second 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;
- (b) C₅-C₇ cycloalkyl or C₅-C₇ cycloalkenyl ring;
- (c) a 5-, 6- or 7-membered heteroalicyclic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur; or
- (d) a benzene ring;

R^E, R^F and R^G are each independently a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R^H is a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur; and

Y is a covalent bond, C_1 - C_6 alkylenyl or C_3 - C_7 cycloalkylenyl;

a tautomer thereof or a pharmaceutically acceptable salt, solvate or polymorph of said compound or tautomer.

2. A compound according to claim 1 wherein R^1 is R^B , which is optionally substituted with one or more R^7 groups.

3. A compound according to claim 1 wherein R^1 is R^D , which is optionally substituted with one or more R^7 groups.

4. A compound according to claim 1 wherein R^7 is halo, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, OR^{12} or $CONR^{12}R^{13}$.

5. A compound according to claim 1 wherein R^2 is hydrogen.

6. A compound according to claim 1 wherein R^3 is hydrogen, C_1 - C_6 alkyl, which is optionally substituted with one or more R^8 groups, or R^E , which is optionally substituted with one or more R^9 groups; and wherein R^E is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur.

7. A compound according to claim 1 wherein R^4 is hydrogen, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_2 - C_6 alkenyl or C_2 - C_6 alkynyl.

8. A compound according to claim 1 wherein $-NR^3R^4$ forms R^F , which is optionally substituted with one or more R^{10} groups and wherein R^F is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms containing at least one nitrogen atom and optionally one other atom selected from oxygen and sulphur.

9. A compound according to claim 1 wherein Y is C_1 - C_6 alkylenyl.

10. A compound according to claim 1 wherein R^{15} is $R^{17}C(O)$ or $R^{18}SO_2$ and R^{16} is hydrogen or C_1 - C_6 alkyl.

11. A compound according to claim 1 wherein R^{15} is R^{17} and R^{16} is hydrogen or C_1 - C_6 alkyl.

12. A compound according to claim 1 wherein $-NR^{15}R^{16}$ constitutes a 3- to 8-membered saturated ring which may optionally include one or more further heteroatoms selected from nitrogen, oxygen and sulphur, and which may optionally be substituted with one or more groups selected from R^{21} , R^{22} and $(C_1-C_6 \text{ alkoxy})C_1-C_6 \text{ alkyl}$.

13. A compound according to claim 1 wherein R^6 is positioned on N^1 .

14. A compound according to claim 1 wherein

R^6 is C_1-C_6 alkyl or C_1-C_6 haloalkyl, each of which is optionally substituted by C_1-C_6 alkoxy, C_1-C_6 haloalkoxy or a cyclic group selected from R^J , R^L and R^M , or R^6 is R^N or hydrogen;

R^J is a C_3-C_7 monocyclic cycloalkyl group;

R^L and R^N are each independently a monocyclic, saturated or partly unsaturated ring system containing between 4 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur; and

R^M is a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur.

15. A compound according to claim 1 wherein

R^3 is hydrogen, C_1-C_4 alkyl, which is optionally substituted with one or more R^8 groups, or R^E , which is optionally substituted with one or more R^9 groups;

R^4 is hydrogen, C_1-C_6 alkyl or C_1-C_6 haloalkyl;

or $-NR^3R^4$ forms R^F , which is optionally substituted with one or more R^{10} groups;

R^6 is C_1-C_4 alkyl or C_1-C_4 haloalkyl, each of which is optionally substituted by C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or a cyclic group selected from R^J , R^L and R^M , or R^6 is R^N or hydrogen;

R^A is a monocyclic C_3-C_8 cycloalkyl group;

R^B is phenyl;

R^C is a monocyclic saturated or partly unsaturated ring system containing between 3 and 8 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R^D is a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur;

R^E is a monocyclic saturated ring system containing between 3 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R^F is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R^J is cyclopropyl or cyclobutyl;

R^L and R^N are each independently a monocyclic saturated ring system containing either 5 or 6 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R^M is a 5- or 6-membered heteroaromatic ring containing a heteroatom selected from nitrogen, oxygen and sulphur; and

Y is C₁-C₆ alkylenyl.

16. A compound according to claim 15 wherein R¹ is a cyclic group selected from R^A, R^B, R^C and R^D, each of which is optionally substituted with one or more R⁷ groups;

R⁷ is halo, C₁-C₆ alkyl, C₁-C₆ haloalkyl, OR¹² or CONR¹²R¹³;

R⁸ is halo, phenyl, C₁-C₆ alkoxyphenyl, OR¹², NR¹²R¹³, NR¹²CO₂R¹⁴, CO₂R¹², CONR¹²R¹³, R^G or R^H, the last two of which are optionally substituted with one or more R⁹ groups;

R^A is a monocyclic C₅-C₇ cycloalkyl group;

R^B is phenyl;

R^C is a monocyclic saturated ring system containing between 5 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R^D is a 5-membered heteroaromatic ring containing a heteroatom selected from nitrogen, oxygen and sulphur and optionally up to two further nitrogen atoms in the ring, or a 6-membered heteroaromatic ring including 1, 2 or 3 nitrogen atoms;

R^E is a monocyclic saturated ring system containing between 3 and 7 ring atoms containing one nitrogen atom;

R^F is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms containing at least one nitrogen atom and optionally one other atom selected from oxygen and sulphur;

R^G is a monocyclic saturated ring system containing between 3 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R^H is a 5- or 6-membered heteroaromatic ring containing up to two nitrogen atoms; and

Y is -CH₂-.

17. A pharmaceutical composition comprising a compound of formula (I) as claimed in claim 1, or pharmaceutically acceptable salts, solvates or polymorphs thereof, and a pharmaceutically acceptable diluent or carrier.

18. A method of treatment of a disorder or condition where inhibition of PDE5 is known, or can be shown, to produce a beneficial effect, in a mammal, comprising administering to said mammal a therapeutically effective amount of a compound of formula (I) as claimed in claim 1, or a pharmaceutically acceptable salt, solvate or polymorph thereof.

19. A method according to claim 18, wherein the disorder or condition is diabetes.

20. A method according to claim 18, wherein the disorder or condition is hypertension.